

National Diabetes Inpatient Audit Harms, 2019

England

13 November 2020

Annual report

Foreword

The National Diabetes Inpatient Audit – Harms (NaDIA-Harms) started in May 2018. It is designed to help reduce the serious inpatient harms identified by the NaDIA snapshot audits. Although there has been some reduction in the national point prevalence of both severe hypoglycaemia and inpatient-onset foot ulcers, they remain common; inpatient-onset diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS) rates have shown no improvement. Yet all these serious, potentially life-threatening events are largely preventable.

The NaDIA-Harms audit will enable trusts to identify and analyse local occurrences of these key inpatient harms, supporting local quality improvement (QI) work. By linking to the power of the core National Diabetes Audit (NDA), case-mix adjusted benchmarking will also be reported and risk-adjusted long term outcomes identified. Additionally, national characterisation of which patients are at highest risk will inform the development of better preventive care.

The hard work of all participants is hugely appreciated. Tracking these inpatient harms closely will allow a better understanding of how they occur, and help us to significantly improve safety for people with diabetes within the NHS.

Alistair Lumb, Clinical Lead, NaDIA-Harms

Introduction: Contents

Key details

This report covers four inpatient harms occurring in English hospitals in the 18 month period May 2018 to October 2019:

- Hypoglycaemic rescue [\[?\]](#)
- DKA [\[?\]](#)
- HHS [\[?\]](#)
- Diabetic foot ulcer [\[?\]](#)

The Welsh government chose not to participate in the NaDIA-Harms collection.

Acronyms and abbreviations

The following acronyms and abbreviations are used throughout the report and are not always defined on the slide where they appear:

BMI = Body mass index

DFU = Diabetic foot ulcer

DKA = Diabetic ketoacidosis

HES = Hospital Episode Statistics

HHS = Hyperosmolar hyperglycaemic state

NaDIA = National Diabetes Inpatient Audit

NDA = National Diabetes Audit

RRT = Renal replacement therapy

Navigation

Chapter	Slide
Introduction	4
Key messages	8
Participation	12
Patient profiles	17
Appendix: Case ascertainment	31
Glossary	36
Additional Information	44

Introduction: Overview

- The National Diabetes Inpatient Audit – Harms (NaDIA-Harms) is a **continuous** data collection to record serious inpatient events referred to as ‘harms’ that occur due to errors of inpatient diabetes management. The data collection started on 1 May 2018.
- The objective of NaDIA-Harms is to help reduce the rates of serious inpatient harms by providing hospitals with a system of case-mix adjusted benchmarked measurements.
- All acute hospitals in England should participate.
- The NaDIA-Harms audit is part of the National Diabetes Audit (NDA) programme within the National Clinical Audit and Patient Outcomes Programme (NCAPOP), commissioned by the Healthcare Quality Improvement Partnership (HQIP).
- This report covers NaDIA-Harms data collected between May 2018 and October 2019.

Prepared in collaboration with:



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Introduction: Why is the audit important?

NaDIA-Harms aims to monitor, and in time help reduce, instances of four **life-threatening** diabetes specific inpatient harms originally characterised in the [NaDIA snapshot](#) audits:

Hypoglycaemic rescue: A hypoglycaemic episode (a hypo) is a potentially dangerous drop in a patient's blood glucose (BG) to below 4.0 mmol/L. Rescue treatment is required in severe cases of hypoglycaemia when the patient is either unconscious, too confused to follow instruction or unable to safely swallow because of danger of aspiration. Rescue treatment is applied using an injection of glucose or Glucagon. [?]

A hospital inpatient whose BG levels are optimally managed should only very rarely experience a severe hypoglycaemic episode requiring rescue treatment.

DKA: Diabetic ketoacidosis (DKA) mainly occurs in people with type 1 diabetes when a severe lack of insulin means the body cannot use glucose for energy and the body starts to break down other body tissue, releasing ketones as an alternative energy source. This can lead to life threatening ketoacidosis if the levels are too high. [?]

The development of DKA after admission suggests that the inpatient's insulin treatment was omitted, or insufficient levels of insulin were provided, for an appreciable time. DKA is a potentially life-threatening emergency which should not develop in hospital.

HHS: Hyperosmolar hyperglycaemic state (HHS) mainly occurs in people with type 2 diabetes who experience very high blood glucose levels (often over 40mmol/L). It can develop over a course of days or weeks through a combination of illness (e.g. infection) and dehydration and following high dose steroid therapy. [?]

HHS is a potentially life-threatening emergency which should not develop in hospital.

Diabetic foot ulcer: Patients with diabetes are at a higher risk of developing foot lesions (ulcers) if they have diabetes associated blood flow (ischaemia) and nerve problems (neuropathy). [?]

Preventive care should stop new foot lesions developing in hospital.

These events are distressing, slow-down recovery, may be life-threatening and are entirely preventable.



Introduction: Why is this report important?

Submission to NaDIA-Harms will contribute to efforts to **reduce** the rates of serious and avoidable inpatient harms. Data collected by NaDIA-Harms will facilitate local **quality improvement** work through the production of **risk-adjusted outcomes** and the identification of **patients at risk**.



What's in the report?

This report includes: **participation** to date; the number of **submissions** of each inpatient harm; the estimated **case ascertainment** of each inpatient harm; and the **patient profiles** of people that experience each inpatient harm. The patient profiles include demographics, diabetes characteristics, treatment targets, care processes, admission characteristics and comorbidities.



The audit team appreciate the hard work of all submitters and recognise that it can initially be difficult to set up systems that record all inpatient harms.

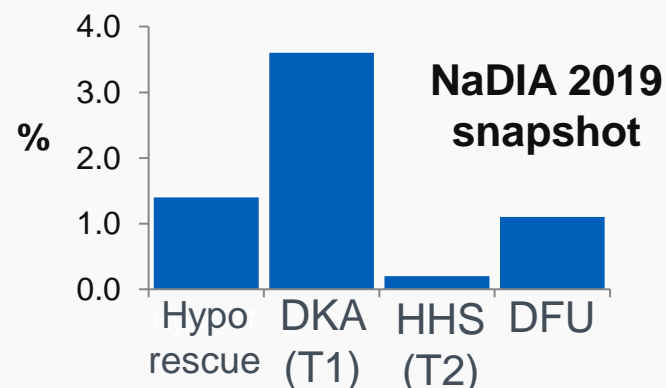


Introduction: NaDIA snapshot audit

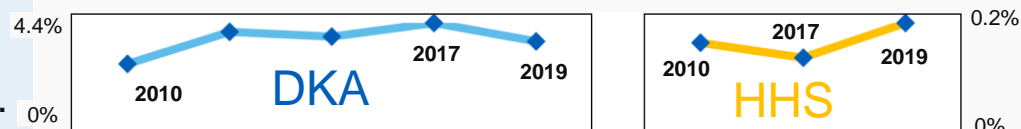
Since 2010 information about the four inpatient harms has been collected in the **NaDIA snapshot audit**, which takes place on a given day in late September.

On the audit day, [NaDIA 2019](#) found that:

- 1.4 per cent of inpatients with diabetes had required **hypoglycaemic rescue** in the last 7 days.
- 3.6 per cent with type 1 diabetes had developed **DKA** during their hospital stay.
- 0.2 per cent with type 2 diabetes had developed **HHS** during their hospital stay.
- 1.1 per cent had developed a **diabetic foot ulcer** during their hospital stay.



Changes over time: Whilst hypoglycaemic rescue and DFU both have reduced since the [NaDIA snapshot](#) began in 2010, similar reductions are not evident for DKA and HHS:



Requirements: The snapshot nature of the NaDIA collection, coupled with the relatively low incidence of the four inpatient harms, means that continuous collection via NaDIA-Harms is needed to allow robust monitoring at local level, and contribute to the drive to lower the incidence of these serious inpatient harms.

Comparability: For the first time, NaDIA snapshot figures have been adjusted for comparison against the number of cases in NaDIA-Harms. Estimated case ascertainment in NaDIA-Harms ranges from 20 per cent (DKA) to just 6 to 8 per cent (others). Details can be found in the [Appendix](#).



National Diabetes Inpatient Audit: Harms 2019

Key messages



Key messages: Participation

Participation

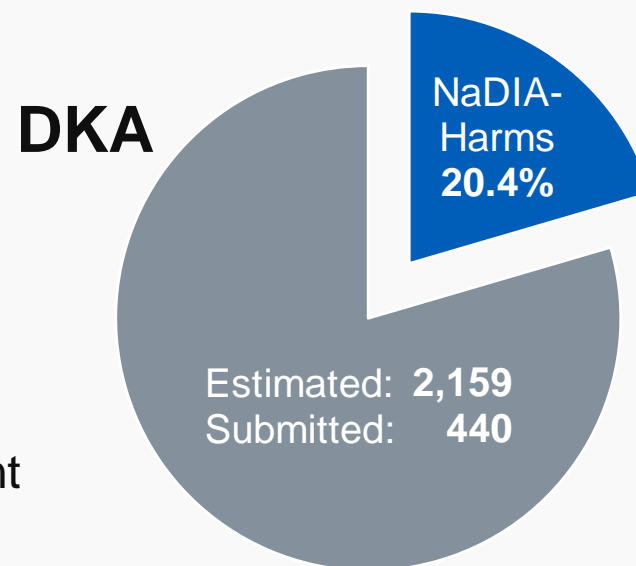
All acute hospitals in England should participate in NaDIA-Harms.

100 NHS trusts have started to submit to the audit.

For comparison, 131 NHS trusts are known to be eligible for the NaDIA snapshot audit, meaning that NaDIA-Harms **participation** is around **76 per cent**. 51 NHS trusts (**39 per cent**) are **regular**¹ NaDIA-Harms submitters.

Case ascertainment

- 2,905 inpatient harms were submitted between May 2018 and October 2019 (18 months).
- Using estimates derived from the [NaDIA 2019](#) snapshot, case ascertainment in NaDIA-Harms ranges from 6 (diabetic foot ulcer) to 20 per cent (DKA).



Recommendation 1: Acute hospitals should all participate in NaDIA-Harms, an important improvement initiative.



Key messages: Higher risk characteristics

Higher risk characteristics

Characteristics that are consistently¹ associated with higher rates of inpatient harms include:



- **White** ethnicity
- Current **smoker**
- Lower **BMI** (except DFU)
- **Type 1** diabetes
- Longer diabetes **duration**
- Impaired **renal function** (except DKA)



- Higher **HbA1c** and **cholesterol**
- Missing **treatment targets** and **care processes** in the audit year before admission

- **Emergency** (all) and **medical** (except DFU) admissions
- **Complications:** Admitted for DKA (except DFU), Admitted with diabetic foot disease, Heart failure (except DKA) and/or RRT required during admission



Recommendation 2: Healthcare professionals should be aware of the increased risk of harm in hospital inpatients with higher risk characteristics.



Key messages: Comments

- NaDIA-Harms is a new audit involving continuous data collection
- Setting up processes to identify and collect each inpatient harm has been a challenge, accounting for the under-reporting compared with estimates based on the NaDIA snapshot audit.
- The National Diabetes Foot Audit (NDFa) also involves continuous data collection, and data collection started from a relatively low starting point.
- The NDFa now captures an estimated 30 per cent of foot ulcers, and has already revealed very valuable insights into the association between structures of care and outcomes, leading to changes in practice.
- NaDIA-Harms has already revealed links between patient characteristics held in the core National Diabetes Audit (NDA) and the development of inpatient Harms.
- These characteristics could be used to identify on admission those at risk of significant harm, allowing appropriate interventions to be put in place to mitigate that risk”.



Participation



Participation: Overview

Audit questions: How many NHS trusts participated in the 2019 NaDIA-Harms audit? How many serious inpatient harms were recorded?

How is data collected? The NaDIA-Harms collection opened in May 2018.

NHS trusts in England are encouraged to report instances (NHS number, date, hospital site) of four serious [inpatient harms](#) (hypoglycaemic rescue, DKA, HHS, diabetic foot ulcer) that had developed during the inpatient's stay.

Trusts can also record confirmation that no inpatient harms have occurred during a calendar month.

Why is this important? These inpatient harms are preventable. NaDIA-Harms will provide case-mix adjusted, benchmarked measurements and risk scores to facilitate local quality improvement work.

Key findings

- 108 NHS trusts in England have registered for the NaDIA-Harms audit.
- **100** NHS trusts in England have participated in the audit¹ and **51** submitted in every quarterly period since inception² (May 2018).

Context: **131** NHS trusts are known to be eligible for NaDIA snapshot³, meaning that NaDIA-Harms participation is around **76 per cent**.

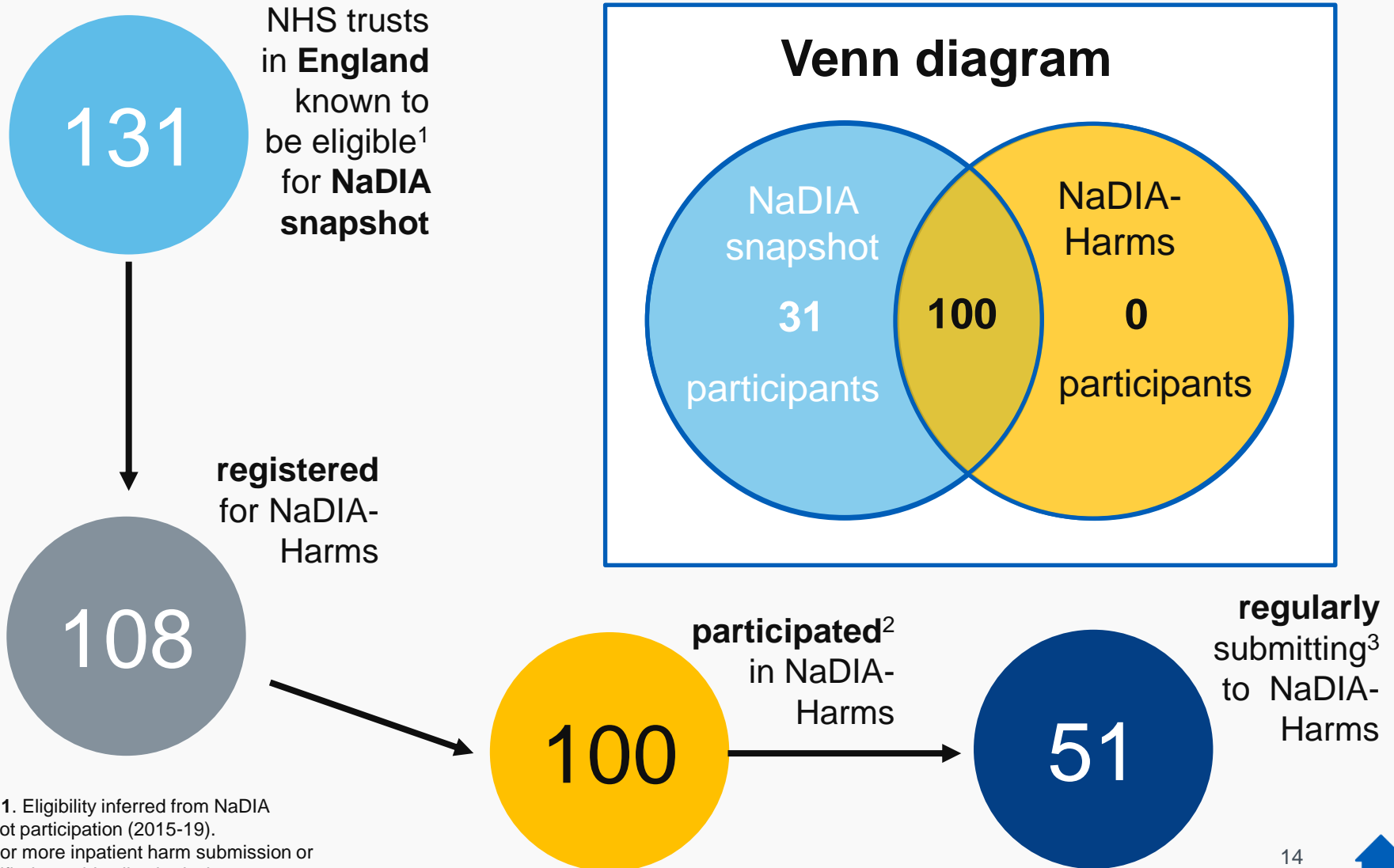


Estimated case ascertainment in NaDIA-Harms ranges from **20 per cent** (DKA) to just **6 to 8 per cent** (others) – see [Appendix](#).

Notes: 1. One or more inpatient harm submission or any verified monthly nil submission. 2. One or more inpatient harm submission or any verified monthly nil submission in all six quarterly periods. 3. Eligibility inferred from NaDIA snapshot participation (2015-19).



Participation: Submitters

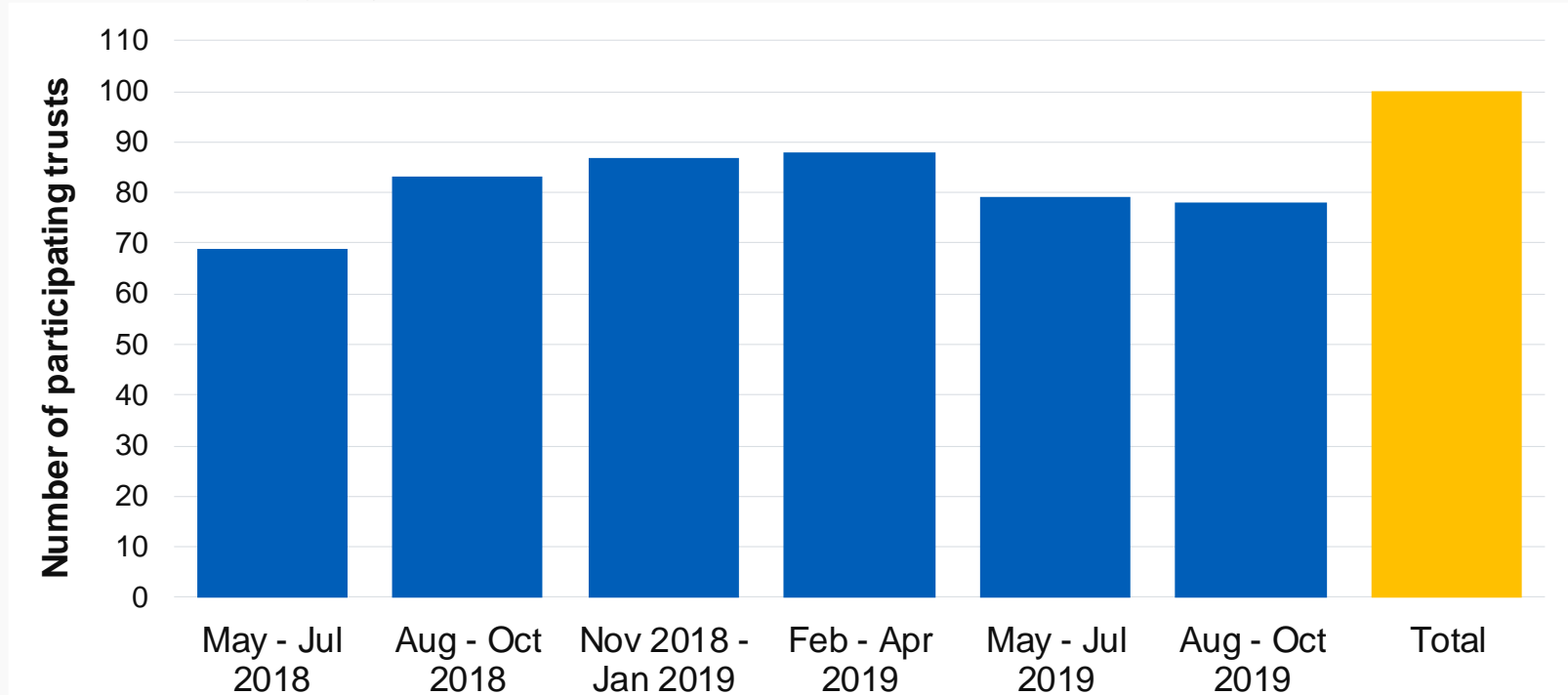


Notes: 1. Eligibility inferred from NaDIA snapshot participation (2015-19).
2. One or more inpatient harm submission or any verified monthly nil submission.
3. As for note 2, in each quarterly period. .



Participation: Submitters over time

Figure 1: Number of participating¹ NHS trusts, by quarterly period where inpatient harm occurred, England, May 2018 - October 2019



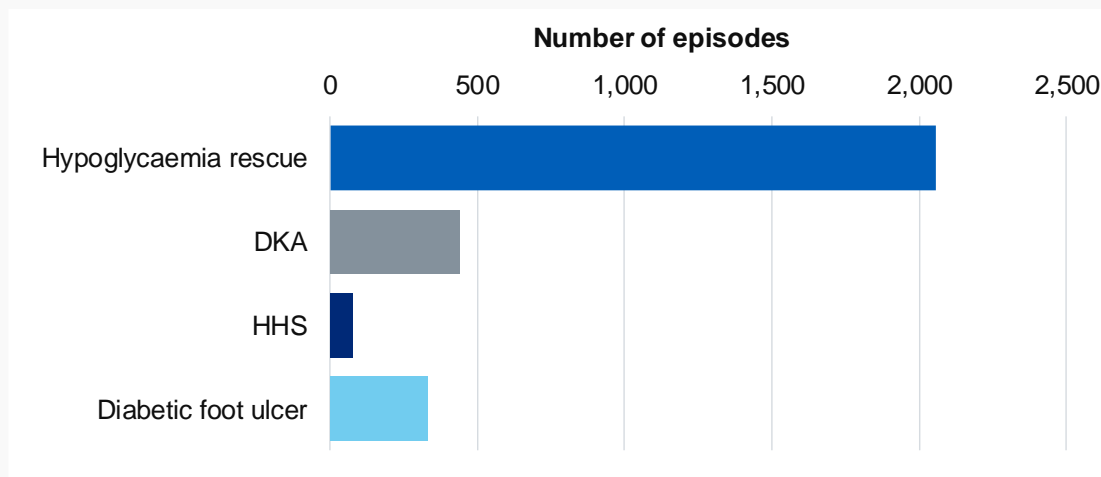
Findings

- When compared to the number of NHS trusts known to be eligible for the NaDIA snapshot, NaDIA-Harms participation is around **76 per cent** (100 of 131).
- The number of participants has **not risen** substantially despite an initial increase.



Participation: Submissions over time

Figure 2: Number of episodes, by inpatient harm,
England, May 2018 - October 2019 (rounded¹)



Context

As this is a new data collection, quarterly changes in the rate of inpatient harms may reflect participation trends rather than real changes in incidence.

Table 1: Number of episodes, by inpatient harm, by quarterly period that inpatient harm occurred, England, May 2018 - October 2019 (rounded¹)

Inpatient harm	May - Jul 2018	Aug - Oct 2018	Nov 2018 - Jan 2019	Feb - Apr 2019	May - Jul 2019	Aug - Oct 2019	Total
Hypoglycaemic rescue [?]	210	340	445	405	350	300	2,055
DKA [?]	50	85	80	80	70	75	440
HHS [?]	5	15	25	15	15	10	80
Diabetic foot ulcer [?]	55	50	60	70	50	40	330
Total	325	490	610	570	485	425	2,905

Notes: 1. Counts have been rounded. Counts between 1 and 7 are represented as a 5. All counts greater than 7 have been rounded to the nearest five. Consequently the total will not usually match the sum of the four constituent inpatient harms.



Patient profiles



Patient profiles: Overview

Audit questions: Are particular individual characteristics associated with a greater risk of inpatient harm?

How is data collected?

Inpatient harms are identified and notified by hospital teams. Patient demographics, diabetes characteristics, treatment targets and care processes are linked from the core National Diabetes Audit (NDA). Hospital admission characteristics and comorbidities are linked from Hospital Episode Statistics (HES).

Why is this important? A better understanding of high risk features might help target preventive care. In the future such understanding will also permit calculation of case-mix adjusted rates.

Key findings

NaDIA-Harms successfully linked to core NDA (93 per cent) and HES (88 per cent).

Higher risk characteristics found for all three inpatient harms¹ tested were:

- **White** ethnicity
- **Type 1** diabetes
- Longer diabetes **duration**
- Higher **HbA1c**
- Missing **treatment targets** and **care processes** in audit year before admission
- **Emergency** admission
- **Complications during admission:** Admitted with foot disease, RRT required during admission

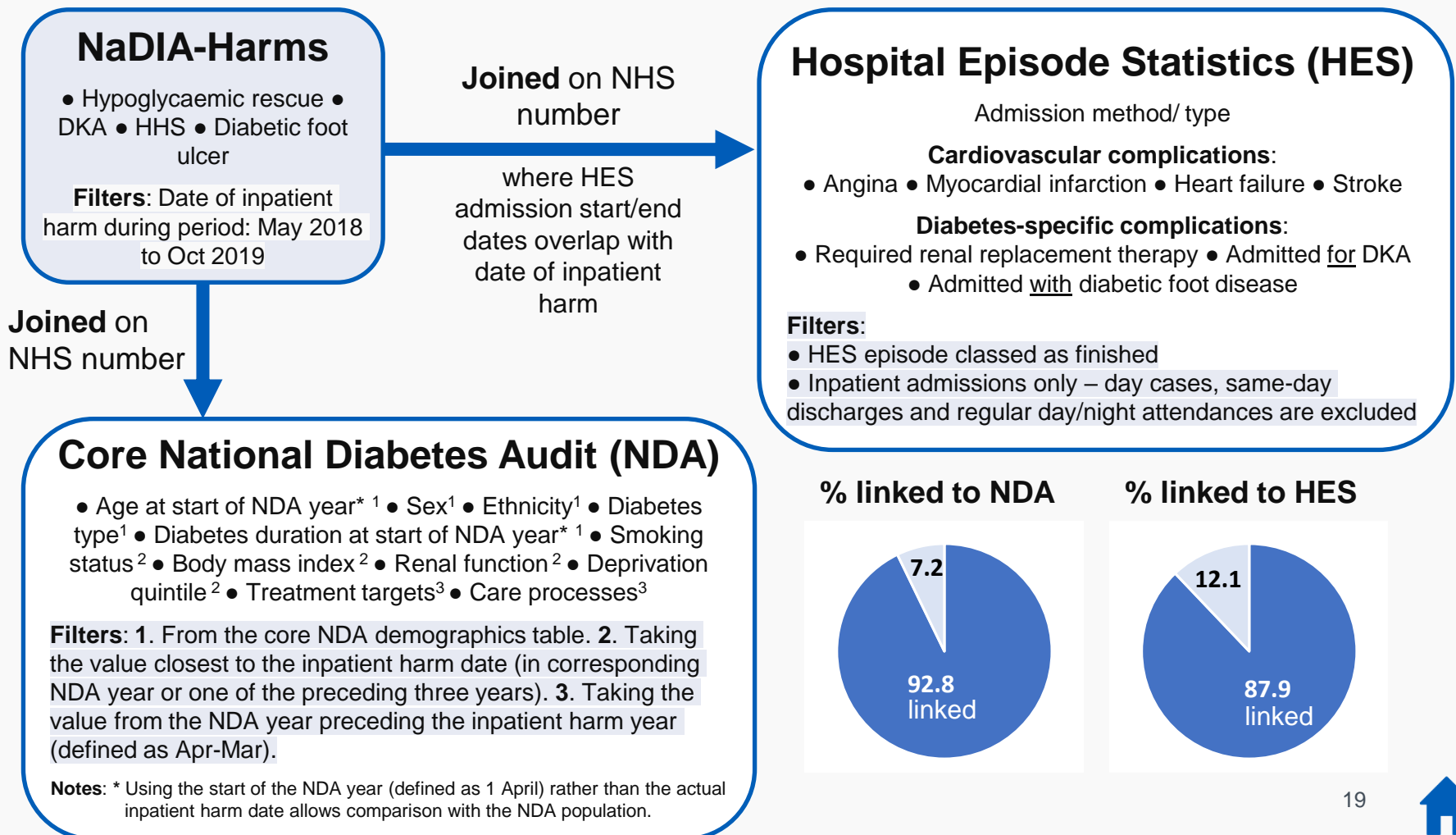
Results for HHS have not been included due to the small number of episodes reported (80).

Notes: 1. A statistically significant difference vs the inpatient population with diabetes at the 0.05 level in all three inpatient harms tested. HHS was excluded from testing due to the small number of episodes reported (80).



Patient profiles: NaDIA-Harms linkage

To produce the patient profiles, NaDIA-Harms data was enriched by linkage:



Patient profiles: Inpatient population

Linkage was also used to produce a comparison population of inpatients with diabetes to compare with the profile of inpatients with inpatient harms recorded:

Core National Diabetes Audit (NDA) 2018-19

- Age at start of NDA year¹
- Sex¹
- Ethnicity¹
- Diabetes type¹
- Diabetes duration at start of NDA year¹
- Smoking status²
- Body mass index²
- Renal function²
- Deprivation quintile²
- Treatment targets³
- Care processes³

Filters: 1. From the core NDA demographics table. 2. Taking the value from NDA 2018-19. 3. Taking the value from the preceding NDA year i.e. NDA 2017-18.

Hospital Episode Statistics (HES) 2018-19

Nights in hospital (Length of stay, LOS)
Admission method/type

Cardiovascular complications:

- Angina
- Myocardial infarction
- Heart failure
- Stroke

Diabetes-specific complications:

- Required renal replacement therapy
- Admitted for DKA
- Admitted with diabetic foot disease

Filters:

- HES episode classed as finished
- Inpatient admissions only – day cases, same-day discharges and regular day/night attendances are excluded.
- Aged 17+ on admission.
- Diagnosed with diabetes in the NDA on or before the admission start date.
- Hospital days where any of the four inpatient harms occurred are excluded.

Joined on
NHS number

Filters: Patient in both NDA and HES 2018-19 cohorts

Comparison: Inpatient population with diabetes 2018-19

Characteristics of the inpatient population during 2018-19, adjusted for nights in hospital e.g. 1 night is counted once, 7 nights are counted 7 times etc.



Patient profiles: Summary

Table 2: Summary of characteristics associated with each inpatient harm²,
England, May 2018 - October 2019

Characteristic		Inpatient harm ²		
		Hypoglycaemic rescue [?]	DKA [?]	Diabetic foot ulcer [?]
Demographics [?]	Age		<i>Younger</i>	<i>Older</i>
	Sex		<i>Female</i>	<i>Male</i>
	Ethnicity	White	White	White
	Smoking	Current	Current	
	Deprivation	<i>Least</i>		
	BMI	Lower	Lower	
Diabetes characteristics [?]	Diabetes type	Type 1	Type 1	Type 1
	Diabetes duration	Longer	Longer	Longer
	Renal function	Worse	<i>Better</i>	Worse
Treatment targets and care processes [?]	Blood pressure			
	Cholesterol	Higher	Higher	
	HbA1c	Higher	Higher	Higher
	Met 3 treatment targets	Lower	Lower	Lower
	All 8 care processes	Lower	Lower	Lower
Hospital admissions [?]	Admission method	Emergency	Emergency	Emergency
	Admission type	Medical	Medical	<i>Surgical</i>
Complications during admission: No associations with Angina, Myocardial infarction or Stroke [?]		Admitted <u>for</u> DKA	Admitted <u>for</u> DKA	
		Admitted <u>with</u> foot disease	Admitted <u>with</u> foot disease	Admitted <u>with</u> foot disease
		Heart failure		Heart failure
		RRT required	RRT required	RRT required

Patient profiles

for each of the three inpatient harms in Table 2 are provided on the following three slides [22](#) to [24](#).

HHS has not been included in the table due to the small number of episodes reported (80).

Key:

A characteristic is in **bold** where the same statistically significant difference vs the inpatient population with diabetes at the 0.05 level was found in at least two of the three inpatient harms tested.

A trend (e.g. older / younger) is *italicised* where only found to be significant for one of the three inpatient harms tested.

Notes:

2. See [Patient profiles: Endnotes](#)



Patient profiles: Hypoglycaemic rescue

Compared to the total population of inpatients with diabetes, people submitted to NaDIA-Harms who experienced hypoglycaemic rescue [?] in hospital were:



- More likely to be ethnically **White** (88 vs 84 per cent)
- More likely to have **type 1** diabetes (35 vs 9 per cent)
- Likely to have had **diabetes for longer** (median 18 vs 11 years)
- More likely to be a **current smoker** (18 vs 13 per cent)
- Likely to have **impaired renal function** (median eGFR 60 vs 69)
- Less likely to be in the most **deprived** quintile (23 vs 26 per cent)
- Likely to have a lower **BMI** (median 26 vs 28)



- More likely to be admitted as an **emergency** (94 vs 81 per cent)
- More likely to be a **medical** admission (79 vs 67 per cent)
- More likely to be admitted for **DKA** (10 vs 1 per cent) and/or admitted with **foot disease** (8 vs 6 per cent)
- More likely to have **heart failure** during admission (25 vs 19 per cent)
- More likely to require **RRT** (7 vs 4 per cent) during admission

In the audit year before admission:

- More likely to have **HbA1c** >58 mmol/mol (74 vs 44 per cent)
- More likely to have **cholesterol** \geq 5 mmol/L (35 vs 31 per cent)
- More likely to have missed one or more **treatment target** (85 vs 68 per cent)
- More likely to have missed one or more **care process** (60 vs 52 per cent)



Patient profiles: DKA

Compared to the total population of inpatients with diabetes, people submitted to NaDIA-Harms who developed DKA [?] in hospital were:



- Likely to be **younger** (median 67 vs 74 years)
- More likely to be **female** (52 vs 48 per cent)
- More likely to be ethnically **White** (94 vs 84 per cent)
- More likely to have **type 1** diabetes (67 vs 9 per cent)
- Likely to have had **diabetes for longer** (22 vs 11 years)
- More likely to be a **current smoker** (21 vs 13 per cent)
- Less likely to have **impaired renal function** (median eGFR 78 vs 69)
- Likely to have a lower **BMI** (median 25 vs 28)



- More likely to be admitted as an **emergency** (91 vs 81 per cent)
- More likely to be a **medical** admission (71 vs 67 per cent)
- More likely to be admitted **for DKA** (55 vs 1 per cent)
- Less likely to have **heart failure** during admission (12 vs 19 per cent)
- More likely to require **RRT** (8 vs 4 per cent) during admission

In the audit year before admission:

- More likely to have **HbA1c** >58 mmol/mol (74 vs 44 per cent)
- More likely to have **cholesterol** \geq 5 mmol/L (41 vs 31 per cent)
- More likely to have missed one or more **treatment target** (93 vs 68 per cent)
- More likely to have missed one or more **care process** (61 vs 52 per cent)



Patient profiles: Diabetic foot lesion

Compared to the total population of inpatients with diabetes, people submitted to NaDIA-Harms who developed a diabetic foot lesion [?] in hospital were:



- Likely to be **older** (median 77 vs 74 years)
- More likely to be **male** (63 vs 52 per cent)
- More likely to be ethnically **White** (91 vs 84 per cent)
- More likely to have **type 1** diabetes (15 vs 9 per cent)
- Likely to have had **diabetes for longer** (median 15 vs 11 years)
- Likely to have **impaired renal function** (median eGFR 59 vs 69)

- More likely to be admitted as an **emergency** (88 vs 82 per cent)
- More likely to be a **surgical** admission (33 vs 25 per cent)
- More likely to have been admitted with **diabetic foot disease** (14 vs 6 per cent)
- More likely to require **RRT** (9 vs 5 per cent) during admission
- More likely to have **heart failure** during admission (31 vs 19 per cent)



In the audit year before admission:

- More likely to have **HbA1c** >58 mmol/mol (51 vs 44 per cent)
- More likely to have missed one or more **treatment target** (74 vs 68 per cent)
- More likely to have missed one or more **care process** (63 vs 52 per cent)



Patient profiles: Demographics

Table 3: Patient demographics¹, by inpatient harm²,

Inpatient harms: England, May 2018 - October 2019. Inpatient population: England, 2018-19 (rounded³)

Group	Age ⁶		Sex		Ethnicity		Smoking status			Deprivation quintile			BMI				
	Median	n	Male	Female	White	Non-white	Current smoker	Ex-smoker	Non-smoker ⁷	Most deprived	Least deprived	Significance	Median	n			
			%	%	%	%	%	%	%	%	%						
Inpatient population with diabetes ⁴ [?]	74.0		52.5	47.5	84.1	15.9	12.9	39.2	47.8	26.0	14.2		28.2				
Hypoglycaemic rescue [?]	74.0	n	51.4	48.6	n	88.2	11.5	*	17.9	35.4	47.0	*	22.9	16.3	*	26.4	*
DKA [?]	67.0	*	47.8	52.2	*	94.0	6.0	*	21.1	30.0	48.9	*	24.7	15.7	n	25.0	*
Inpatient population with diabetes ⁵ (LOS≥3) [?]	74.0		52.3	47.7		84.3	15.7		12.7	39.1	48.2		25.9	14.3		28.0	
Diabetic foot ulcer [?]	77.0	*	63.3	35.0	*	90.7	9.3	*	12.1	41.4	46.6	n	25.9	12.1	n	28.4	n

Findings: Higher risk characteristics¹¹ for inpatient harms include:

- **White** ethnicity
- Being a **current smoker** (except DFU)
- Lower **BMI** (except DFU)

HHS has not been included in the table due to the small number of episodes reported (80).

Notes: Significance vs. inpatient population with diabetes: * = statistically significant at the 0.05 level. n = not statistically significant. Proportions are tested using the Chi-squared test. Medians are tested using the Mann-Whitney U test. **1.** Cases with missing or unknown values are excluded from the calculations. The proportions of the inpatient population (data row 1) with missing or unknown values are: Age 0.0%; Sex 0.2%; Ethnicity 9.7%; Smoking status 4.9%; Deprivation quintile 5.7%; BMI 29.2%. **2, 3, 4, 5, 6, 7, 11.** See [Patient profiles: Endnotes](#).



Patient profiles: Diabetes characteristics

Table 4: Diabetes characteristics¹, by inpatient harm²,

Inpatient harms: England, May 2018 - October 2019. Inpatient population: England, 2018-19 (rounded³)

Group	Diabetes type		Diabetes duration ⁶	Renal function eGFR [?] (ml/min/1.73m ²)	
	Type 1	Type 2		Median	Median
	%	%			
Inpatient population with diabetes ⁴ [?]	8.8	91.2	11.0	69.4	
Hypoglycaemic rescue [?]	34.7	65.3	*	18.0	*
DKA [?]	67.4	32.6	*	22.0	*
Inpatient population with diabetes ⁵ (LOS≥3) [?]	8.5	91.5		11.0	68.6
Diabetic foot ulcer [?]	15.0	85.0	*	15.0	*

Findings

Higher risk characteristics¹¹ for inpatient harms include:

- Diabetes **type 1**
- Longer diabetes **duration**
- Impaired **renal function** (except DKA)

HHS has not been included in the table due to the small number of episodes reported (80).

Notes: Significance vs. inpatient population with diabetes: * = statistically significant at the 0.05 level. n = not statistically significant. Proportions are tested using the Chi-squared test. Medians are tested using the Mann-Whitney U test.

1. Cases with missing or unknown values are excluded from the calculations.

The proportions of the inpatient population (data row 1) with missing or unknown values are:

Diabetes type 2.3%; Diabetes duration 0.0%; eGFR 12.4%.

2, 3, 4, 5, 6, 11. See [Patient profiles: Endnotes](#).



Patient profiles: Treatment targets and care processes

Table 5: Treatment targets and care processes in the audit year preceding hospital admission^{1,8}, by inpatient harm²,

Inpatient harms: England, May 2018 - October 2019. Inpatient population: England, 2018-19 (rounded³)

Group	Treatment targets ⁸ [?] in year prior to admission				Received all 8 care processes ⁸ [?] in year prior to admission	
	Blood pressure (≤ 140/80)	Cholesterol (< 5 mmol/L)	HbA1c (≤ 58 mmol/mol) ⁴	Met all 3 treatment targets		
	%	%	%	%	%	
Inpatient population with diabetes ⁴ [?]	69.6	68.9	56.6	32.4	48.0	
Hypoglycaemic rescue [?]	69.9 n	65.4 *	25.8 *	14.9 *	39.6 *	
DKA [?]	72.7 n	59.1 *	14.8 *	6.8 *	38.6 *	
Inpatient population with diabetes ⁵ (LOS≥3) [?]	69.5	68.9	56.6	32.3	47.1	
Diabetic foot ulcer [?]	64.9 n	71.9 n	49.1 *	26.3 *	36.8 *	

HHS has not been included in the table due to the small number of episodes reported (80).

Findings: Higher risk characteristics¹¹ for inpatient harms include:

- Higher **HbA1c** in the audit year prior to admission
- Not meeting all 3 **treatment targets** in the audit year prior to admission
- Not having all 8 **care processes** in the audit year prior to admission



Patient profiles: Hospital admissions

Table 6: Hospital admission method and main speciality¹, by inpatient harm²,
 Inpatient harms: England, May 2018 - October 2019. Inpatient population: England, 2018-19 (rounded³)

Group	Admission method			Admission type		
	Emergency	Elective	Other ⁹	Medical	Surgical	Other ⁹
	%	%	%	%	%	%
Inpatient population with diabetes ⁴ [?]	81.1	12.4	6.5	67.4	26.3	6.5
Hypoglycaemic rescue [?]	93.6	3.2	3.2	78.7	20.7	0.5
DKA [?]	91.0	7.7	2.6	70.5	29.5	1.3
Inpatient population with diabetes ⁵ (LOS≥3) [?]	81.7	11.1	7.2	67.7	24.7	7.8
Diabetic foot ulcer [?]	87.9	5.2	6.9	65.5	32.8	1.7

Findings: Higher risk characteristics¹¹ for inpatient harms include:

- **Emergency** admission
- **Medical** admission (except DFU)

HHS has not been included in the table due to the small number of episodes reported (80).

Notes: Significance vs. inpatient population with diabetes: * = statistically significant at the 0.05 level. n = not statistically significant. Proportions are tested using the Chi-squared test.

1. Cases with missing or unknown values are excluded from the calculations.
 The proportions of the inpatient population (data row 1) with missing or unknown values are:
 Admission method 0.0%; Admission type 0.2%.

2, 3, 4, 5, 9, 11. See [Patient profiles: Endnotes](#).



Patient profiles: Complications

Table 7: Complications during hospital admission, by inpatient harm²,
 Inpatient harms: England, May 2018 - October 2019. Inpatient population: England, 2018-19 (rounded³)

Group	Cardiovascular complications ¹⁰ (at any point during admission)				Diabetes-specific complications ¹⁰ (at specified point during admission)		
	Angina	Myocardial infarction	Heart failure	Stroke	Admitted <u>for</u> DKA	Admitted <u>with</u> diabetic foot disease [?]	RRT required <u>during</u> admission
	%	%	%	%	%	%	%
Inpatient population with diabetes ⁴ [?]	7.9	3.7	18.5	6.7	1.1	5.8	4.4
Hypoglycaemic rescue [?]	6.9 n	4.5 n	25.3 *	6.6 n	10.4 *	8.0 *	7.2 *
DKA [?]	6.4 n	5.1 n	11.5 *	7.7 n	55.1 *	6.4 *	7.7 *
Inpatient population with diabetes ⁵ (LOS≥3) [?]	7.6	3.7	19.5	7.5	0.9	6.4	4.7
Diabetic foot ulcer [?]	6.9 n	5.2 n	31.0 *	6.9 n	3.4 n	13.8 *	8.6 *

Findings: Higher risk characteristics¹¹ for inpatient harms include:

- **Cardiovascular complications:** Heart failure during admission (except DKA)
- **Diabetes-specific complications:** Admitted for DKA, Admitted with diabetic foot disease, RRT required during admission

HHS has not been included in the table due to the small number of episodes reported (80).



Patient profiles: Endnotes

1. Endnote 1 is specific to each table and the notes are listed beneath the individual tables.
2. HHS has not been included in the table due to the small number of episodes reported (80).
3. Percentages are derived from rounded values. Underlying counts between 1 and 7 are set to 5. All counts greater than 7 are rounded to the nearest five. Consequently some percentages may not sum up to exactly 100 per cent.
4. Proportions for the inpatient population with diabetes are calculated using the sum of nights in hospital during 2018-19 for people with diabetes in NDA 2018-19, where diabetes was diagnosed on or before admission. Day cases and same-day discharges are counted as zero days and are therefore excluded. Patients with diabetes recorded in HES 2018-19 that are not in NDA 2018-19 are excluded. Medians are calculated using the value on admission, counted once for each night in hospital. For further information, see: [Patient profiles: Inpatient population](#).
5. See note 4 above, with additional exclusion for admissions that are less than 3 nights due to the audit requirement that new onset foot ulcers must occur more than 72 hours after admission.
6. Calculated using the start of the NDA audit year (defined as 1 April for this report) rather than the actual inpatient harm date allows comparison with the total NDA population
7. Group comprises of non-smokers whose history is unknown and patients who have never smoked.
8. Treatment target and care process information is taken from the NDA audit year prior to the hospital admission (e.g. from 2017-18 where the hospital admission is in 2018-19).
9. The category 'Other' covers: Admission methods 'Maternity' and 'Other'; Admission types 'Other', 'Pathology', 'Psychiatry' and 'Radiology'.
10. Complication recorded at any point during the admission, except: 'Admitted for DKA' and 'Admitted with diabetic foot disease'.
11. Where the same statistically significant difference vs the inpatient population with diabetes at the 0.05 level was found in at least two of the three inpatient harms tested. HHS was excluded from testing due to the small number of episodes reported (80).



Appendix: Case ascertainment



Appendix: Case ascertainment

Overview

Audit questions

What is the case ascertainment (completeness) for DKA, HHS, foot ulcers and hypoglycaemic rescue in NaDIA-Harms?

How is data collected?

Case ascertainment for each type of inpatient harm in NaDIA-Harms was calculated using estimates derived from the [2019 NaDIA snapshot](#). The full methodology and breakdown of the figures can be found on the following slides [33](#) to [35](#).

The NaDIA snapshot audit was performed on a nominated day between 23 and 27 September 2019. Participating hospital teams identified all inpatients with diabetes. Where the patient was able and willing a Bedside Audit form was completed which provided information on the patient's medical treatment (including any inpatient harms experienced during their stay) taken from the patient's notes.

Why is this important?

The snapshot nature of the main NaDIA collection, combined with the low incidence of the four inpatient harms, means that continuous collection is necessary to enable robust monitoring at local level.

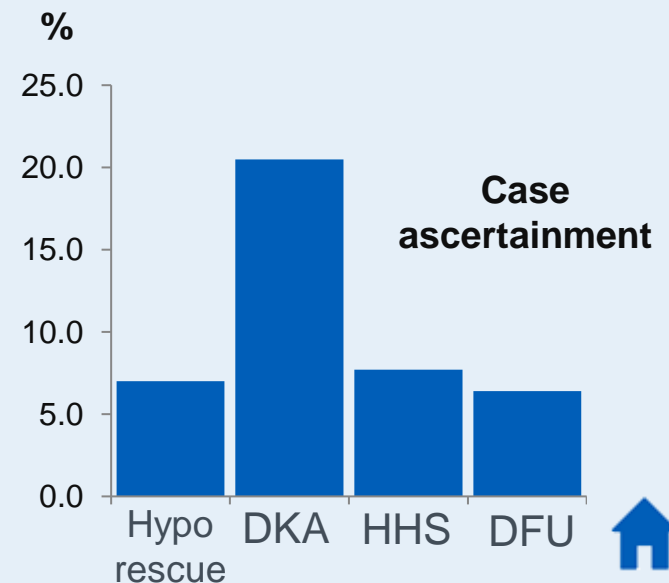
In tandem, the NaDIA snapshot can be used to assess to what extent NaDIA-Harms is capturing inpatient harm information within England.

Context

2,905 inpatient harms were submitted to NaDIA-Harms between May 2018 and October 2019 (18 months). The majority were hypoglycaemic rescue (2,055).

Key findings

Estimated case ascertainment in NaDIA-Harms ranges from **20 per cent (DKA)** to just **6 to 8 per cent (others)**



Appendix: Case ascertainment

DKA

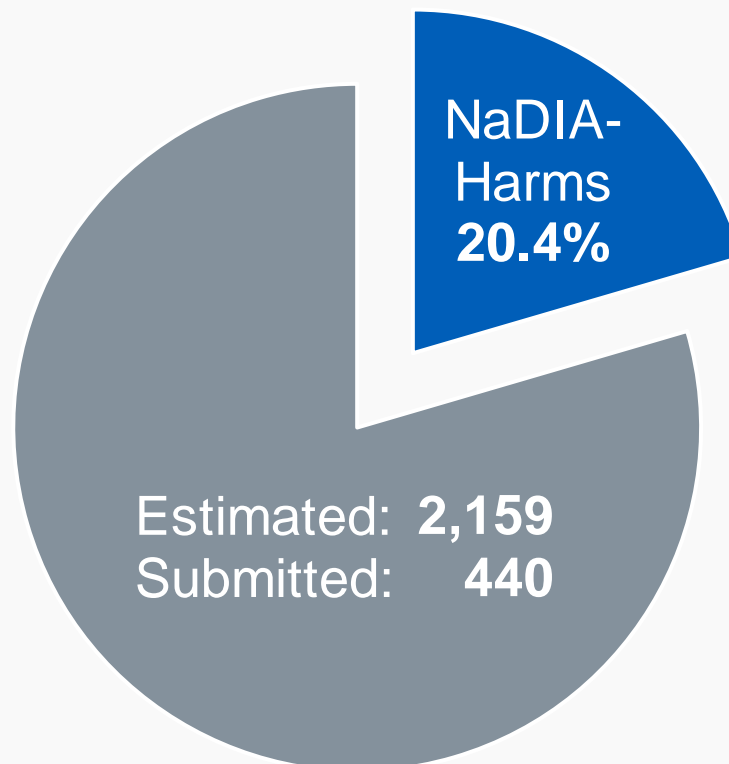
Methodology

- In the [2019 NaDIA snapshot](#)¹ there were 53 cases of hospital-acquired DKA³ reported over 195,380 days in hospital⁴, equating to a rate of 0.00027 cases of DKA per day per inpatient with diabetes.
- Across the English population of 14,500 inpatients with diabetes on a given day, this approximates to 3.9 cases of DKA per day, 1,437 per year or 2,159 scaled to the duration of the NaDIA-Harms audit (549 days).

The 440 cases of DKA in NaDIA-Harms² are therefore estimated to be around 20 per cent of the estimated total cases.

Figure 3: Case ascertainment for: DKA^{2,3,4}, [?]

England, May 2018 - October 2019



Notes: 1. The [2019 NaDIA snapshot](#) was undertaken by participating hospital teams on a nominated day between 23 and 27 September 2019.

2. NaDIA-Harms figures have been rounded to the nearest 5. 3. [NaDIA 2019](#) Bedside Audit Q21: 'Did the patient develop DKA at any time after their admission?' Note that only one instance of DKA per patient is recorded, whereas NaDIA-Harms can collect multiple instances per patient.

4. [NaDIA 2019](#) Bedside Audit Q9: 'Number of nights in hospital?' is used as a proxy for the number of days in hospital.



Appendix: Case ascertainment

HHS and Diabetic foot ulcer

Figure 4: Case ascertainment for:
HHS^{2,3,5}, [?]

England, May 2018 - October 2019

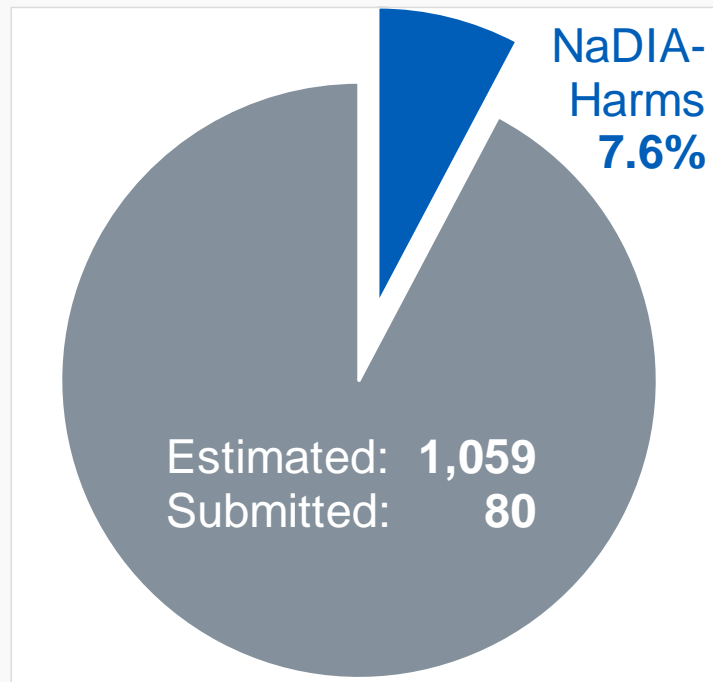
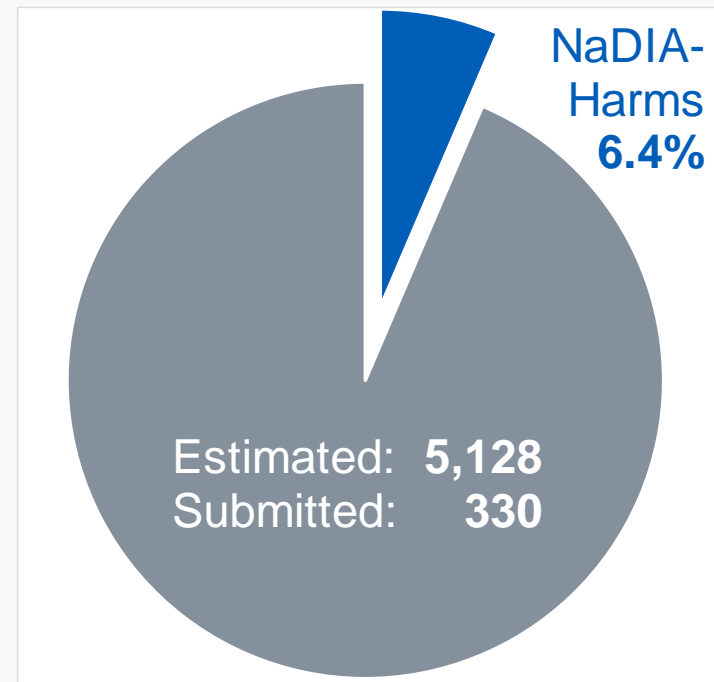


Figure 5: Case ascertainment for:
diabetic foot ulcer^{2,4,5}, [?]

England, May 2018 - October 2019



Notes: 1. The [2019 NaDIA snapshot](#) was undertaken by participating hospital teams on a nominated day between 23 and 27 September 2019. 2. NaDIA-Harms figures have been rounded to the nearest 5. 3. [NaDIA 2019 Bedside Audit Q21](#): 'Did the patient develop HHS at any time after their admission?' Note that only one instance of HHS per patient is recorded, whereas NaDIA-Harms can collect multiple instances per patient. 4. [NaDIA 2019 Bedside Audit Q40](#): 'Did a new foot lesion/ulcer (e.g. heel ulcer) arise during this admission?' Note that only one instance of diabetic foot ulcer per patient is recorded, whereas NaDIA-Harms can collect multiple instances per patient. 5. [NaDIA 2019 Bedside Audit Q9](#): 'Number of nights in hospital?' used as a proxy for the number of days in hospital.

Methodology

Case ascertainment for HHS and diabetic foot ulcer is calculated using the same methodology as for DKA.



Appendix: Case ascertainment

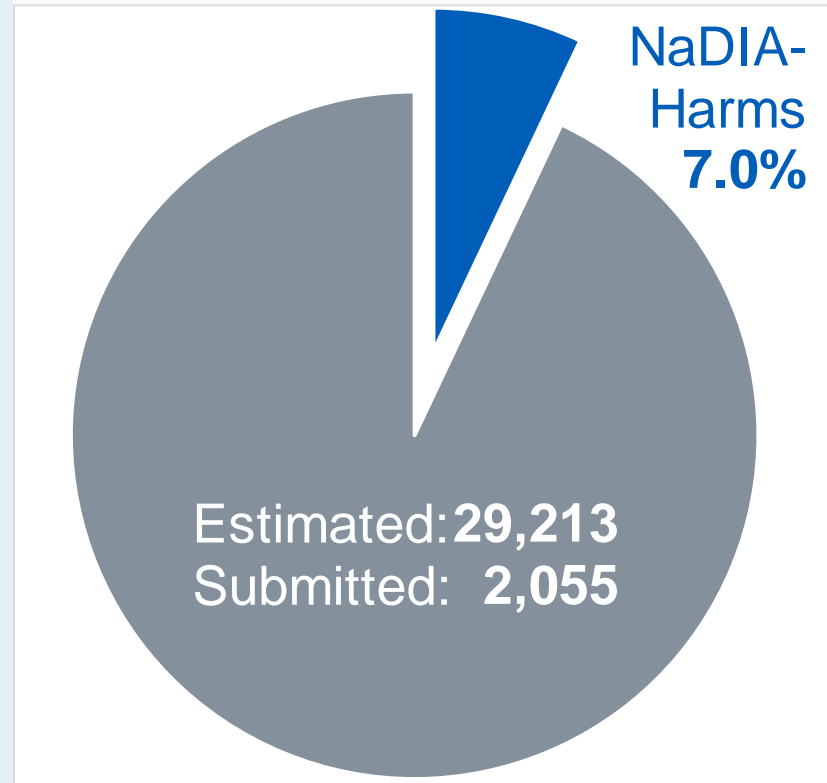
Hypoglycaemic rescue

Methodology

The 2019 NaDIA snapshot¹ recorded whether the inpatient experienced DKA, HHS or diabetic foot ulcer at any point during their hospital stay. In contrast, the snapshot recorded the **total number** of cases of hypoglycaemic rescue over the **seven days** prior to the audit³. The resultant figure was adjusted accordingly to ensure the collection periods were standardised⁴, resulting in estimated case ascertainment of seven per cent of total cases⁵.

Note that the 2019 NaDIA snapshot did not specify “rescue treatment” in the harm definition, which may impact the size of the estimate.

Figure 6: Case ascertainment for: hypoglycaemic rescue^{2,3,4,5}, [?]
England, May 2018 - October 2019



Notes: 1. The [2019 NaDIA snapshot](#) was undertaken by participating hospital teams on a nominated day between 23 and 27 September 2019. 2. NaDIA-Harms figures have been rounded to the nearest 5. 3. [NaDIA 2019](#) Bedside Audit Q18: ‘Number of episodes of hypoglycaemia requiring injectable treatment (glucagon or IV glucose)?’ used as the count of hypoglycaemic rescues within the previous seven days of the inpatient’s stay. Bedside Audit Q13: ‘Is the glucose chart available for review?’ must also be ‘yes’ to be included in the hypoglycaemic rescue count. 4. [NaDIA 2019](#) Bedside Audit Q9: ‘Number of nights in hospital?’ used as a proxy for the number of days in hospital, up to a maximum of seven days. 5. During the NaDIA-Harm data collection it became apparent that there was confusion about the exact definition of the hypoglycaemia harm that should be reported. The definition has been clarified on the NaDIA-Harms [website](#) (summarised on [slide 37](#)) and communication has also been made with those submitting data. This may have influenced the case ascertainment data for this harm.



National Diabetes Inpatient Audit: Harms 2019

Glossary



Glossary:

Definitions: Hypoglycaemic rescue

Guidance on harm specification questions within the NADIA-Harms data collection: **Hypoglycaemic rescue**

Question: 'Did the patient require **injectable rescue** treatment for an episode of hypoglycaemia starting more than 6 hours after admission?'

For the purpose of this audit an episode should be recorded only if subcutaneous and/or intravenous injected **rescue** treatment (glucagon, glucose) for severe hypoglycaemia was used.

For consistency and compatibility this harm is defined **not** by the measured blood glucose level but by the need to urgently counteract **severe** hypoglycaemic symptoms such as loss of consciousness, acute confusion or seizures with injected treatment.

Rescue treatment would usually be intravenous glucose or subcutaneous/ /intramuscular/intravenous glucagon.

For example, these treatments may be required if pre-meal insulin had been given but the meal had not been delivered resulting in severe hypoglycaemic (loss of consciousness, acute confusion, seizures etc due to a low blood glucose) requiring rescue treatment.

Low blood glucose arising in patients receiving intravenous insulin infusions as well as intravenous glucose has led to some misunderstanding of 'rescue treatment'. Intravenous glucose infusions should always run alongside continuous intravenous insulin and their use in this situation should **not** be considered 'rescue treatment' even when the CBG falls below 4.0 mmol/L **provided** that the patient has **no severe** hypoglycaemic symptoms. If, however, the person develops severe hypoglycaemic symptoms such as loss of consciousness, acute confusion or seizures during the infusion and require additional glucose or glucagon this would be considered 'rescue treatment'.



Glossary:

Definition: DKA and HHS

Guidance on harm specification questions within the NADIA-Harms data collection: **DKA**

Question: 'Was the patient diagnosed with new onset DKA more than 24 hours after admission?'

DKA requires three key features for diagnosis:

- Known diabetes or blood glucose over 11.0 mmol/l.
- Ketonaemia (blood ketones 3.0 mmol/l or more) or urine ketones 2+ or more.
- Acidosis with venous pH less than 7.3 or bicarbonate less than 15 mmol/l.

For more on the definition of DKA please refer to the JBDS guidelines on the [ABCD web site](#).



Guidance on harm specification questions within the NADIA-Harms data collection: **HHS**

Question: 'Was the patient diagnosed with new onset HHS more than 24 hours after admission?'

HHS has characteristic features used in its diagnosis:

- Hypovolaemia.
- Marked hyperglycaemia (blood glucose 30 mmol/l or more) without significant ketonaemia (blood ketones less than 3 mmol/l) or acidosis (venous pH 7.3 or more/bicarbonate 15 mmol/l or more).
- Osmolality usually 320 mosmol/kg or more.

For more on the definition of HHS please refer to the JBDS guidelines on the [ABCD web site](#).



Glossary:

Definition: Diabetic foot ulcer

Guidance on harm specification questions within the NADIA-Harms data collection: **Diabetic foot ulcer**

Question: ‘Was the patient diagnosed with a new onset foot ulcer more than 72 hours after admission?’

The audit is not intended to collect reports of foot ulcers that are present on admission, or which develop within 3 days of admission. Grade 2+ Pressure sores on the foot that develop more than 72 hours after admission should be included. Deep tissue injury which has not progressed to skin ulceration is not included. Traumatic skin foot lesions and foot infections which arise during the admission are included.



The definition of ‘Admitted with diabetic foot disease’ used in this report is discussed on [slide 40](#).

For further information on the audit, visit the NaDIA-Harms homepage:
<https://digital.nhs.uk/data-and-information/clinical-audits-and-registries/national-diabetes-in-patient-audit-nadia-harms>



Glossary:

Definition: Admitted with diabetic foot disease

Diabetic foot disease is defined as a foot affected by ulceration that is associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes¹.

People with diabetic foot ulcers sometimes require admission to hospital to treat their foot disease. This occurs when the condition of the foot threatens survival of either the foot or the patient. Such deterioration is often a result of infection (requiring intravenous antibiotics, with or without local surgery) or poor arterial blood flow. Resultant hospital stays and rehabilitation may be lengthy. In extreme cases amputation is required.

To identify people admitted to hospital with diabetic foot disease, the first episode of each admission has been searched for the following **clinical procedures** or **diagnoses** predominantly associated with inpatient management of diabetes related foot disease²:

Foot disease clinical diagnoses

- Diabetes mellitus with peripheral circulatory complications
- Ulcer of the lower limb
- Decubitus ulcer
- Cellulitis
- Osteomyelitis
- Gangrene
- Atherosclerosis

Foot disease clinical procedures

- Debridement of a foot/leg wound
- Minor and major amputation of lower limb

For reporting purposes, the foot disease must be identified in the first episode of the hospital admission. Outputs are called: 'Admitted with diabetic foot disease' or similar.



Glossary:

Definition: Care Processes

Care processes are reported on in the core [National Diabetes Audit](#) (NDA). The latest full [NDA report](#) into Care Processes and Treatment Targets covered the period 01 January 2017 to 31 March 2018.

[NICE](#) recommends that people with diabetes have all 8 of the following care processes at least once a year):

Blood Pressure is a measurement of the force driving the blood through the arteries. Blood pressure readings contain two figures, e.g.130/80. The first is known as the systolic pressure which is produced when the heart contracts. The second is the diastolic pressure which is when the heart relaxes to refill with blood.

BMI measurement – Body Mass Index calculated from weight and height to classify under, normal, overweight and obese.

Serum creatinine – this blood test is used as measure kidney function.

Urinary albumin – this urine test detects the earliest stages of kidney disease.

Cholesterol – this blood test measures a type of fat that can damage blood vessels.

Foot check – this examination checks the blood supply and sensation (feeling) in the feet. Loss of either is a risk for foot disease.

Smoking Status – this records whether the person is a smoker. Smoking increases the diabetic risk for heart attacks and stroke.

HbA1c – this is a blood test for average blood glucose levels during the previous two to three months.



Glossary:

Definition: Treatment targets

Treatment targets are reported on in the core [National Diabetes Audit](#) (NDA). The latest full [NDA report](#) into Care Processes and Treatment Targets covered the period 01 January 2017 to 31 March 2018.

[NICE](#)¹ defines the following target levels to reduce risks of complications for people with diabetes. Note that only the first three (highlighted in blue) are covered in this report:

HbA1c – the closer this is to normal (less than 42 mmol/mol) the lower is the risk of all long term complications of diabetes. **NDA treatment target: ≤ 58 mmol/mol.**

Cholesterol – reducing cholesterol levels lowers the risk of heart attacks and strokes. **NDA treatment target: < 5 mmol/L.**

Blood Pressure – high levels are a risk for heart attacks and strokes; they also drive progression of eye and kidney disease. **NDA treatment target: $\leq 140/80$.**

Primary prevention of CVD – The prescription of statins for people with diabetes aged 40 to 80 years with no history of heart disease to reduce the risk of cardiovascular disease.

Secondary prevention of CVD – The prescription of statins for people with diabetes (any age) with a history of heart disease to reduce the risk of cardiovascular disease.

Combined prevention of CVD – The prescription of statins for people with diabetes that fall into either of the primary or secondary prevention groups.



Glossary:

Estimated glomerular filtration rate¹ (eGFR)

A patient's **estimated glomerular filtration rate** (eGFR) is used to determine how damaged their kidneys are, known as the stage of **chronic kidney disease** (CKD).

eGFR results are given as a stage from 1 of 5:

- **Stage 1 (G1)** – a normal eGFR above 90ml/min, but other tests have detected signs of kidney damage
- **Stage 2 (G2)** – a slightly reduced eGFR of 60 to 89ml/min, with other signs of kidney damage
- **Stage 3a (G3a)** – an eGFR of 45 to 59ml/min
- **Stage 3b (G3b)** – an eGFR of 30 to 44ml/min
- **Stage 4 (G4)** – an eGFR of 15 to 29ml/min
- **Stage 5 (G5)** – an eGFR below 15ml/min, meaning the kidneys have lost almost all of their function



Additional information



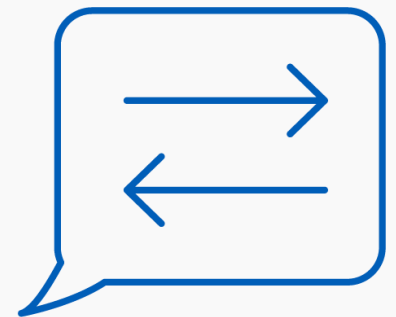
Additional information: Future plans

Next steps

- Circulate this report to the inpatient diabetes community and promote the project to those not participating.
- Write to the clinical teams not currently participating to identify their barriers and offer support.
- Identify good practice from good submitters, create case studies and promote to other services.

Future plans

- Identify services with good practice to support other services in managing and reducing inpatient harms in patients with diabetes.



Additional information: Acknowledgements

The NaDIA-Harms team would like to thank all the people and teams who have worked hard to contribute to this unique and valuable insight into the inpatient care of people with diabetes.

Development and delivery of the NaDIA-Harms is guided by a multi-professional advisory group of clinicians and patient representatives, chaired by Alistair Lumb. The NaDIA-Harms Advisory Group members include:

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NHS Digital is the new name for the Health and Social Care Information Centre. NHS Digital managed the publication of the 2018 annual report.



Diabetes UK is the largest organisation in the UK working for people with diabetes, funding research, campaigning and helping people live with the condition.

Supported by:



Public Health
England

The **National Cardiovascular Intelligence Network (NCVIN)** is a partnership of leading national cardiovascular organisations which analyses information and data and turns it into meaningful timely health intelligence for commissioners, policy makers, clinicians and health professionals to improve services and outcomes.

National Diabetes Inpatient Audit: Harms 2019

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